Relationships Between Ecosystem CO_2 Flux and Vegetation Spectral Reflectance in Southern California Chaparral.

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ABSTRACT

Remote sensing and direct ecosystem flux measurements can both contribute to our understanding of the carbon cycle, yet these methods are poorly matched in time and space. In order to better match the temporal and spatial scales of the remote sensing measurements to those of the eddy flux, we installed automated tram systems within the eddy flux tower footprints at Sky Oaks field station near San Diego, CA. These systems measured hyperspectral reflectance over a 100 m transect throughout the diurnal cycle, allowing us to parameterize and test models of ecosystem carbon flux based on reflectance. Large seasonal and inter-annual variation in ecosystem carbon flux rates, resulting from annual summer droughts and the severe drought of 2002, provided strong tests of these models. In spite of the evergreen characteristics of this vegetation, models based on canopy greenness proved to be the most robust across all seasons and years. These results also focused our attention on the importance of considering solar elevation angle effects when interpreting spectral reflectance measurements in sparse vegetation such as the chaparral. The implications of these results for satellite remote sensing of vegetation carbon flux will be discussed.